



NATIONAL OPEN UNIVERSITY OF NIGERIA
FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY
2025_1 EXAMINATION

COURSE CODE: CHM315

COURSE TITLE: CARBOHYDRATE CHEMISTRY

COURSE UNIT: 2 UNITS

TIME: 2 HOURS

INSTRUCTION: ANSWER QUESTION 1 AND ANY OTHER 2 QUESTIONS

QUESTION 1

(a). Complete the table below: **(5 marks)**

| Disaccharide | Description | Component monosaccharides |
|---------------------|------------------------------|--|
| sucrose | | glucose $1\alpha\rightarrow 2$ fructose |
| maltose | product of starch hydrolysis | |
| | found in fungi | glucose $1\alpha\rightarrow 1$ glucose |
| | main sugar in milk | |
| melibiose | | galactose $1\alpha\rightarrow 6$ glucose |

(ai). What is Homopolysaccharides? **(2 marks)**

(b). Write a short note on the followings heteropolysaccharides: Arabinoxylan, Chitin and Glycosaminoglycans (GAGs). **(10 marks)**

(c). Write a short note on Inulin, highlighting its occurrence, structure, properties, and uses. **(7 Marks)**

(d). Discuss the structure, sources, and significance of pectin, with a focus on its role in food preparation. **(6 Marks)**

QUESTION 2

(a). Pectin is a polymer of α -Galacturonic acid with a variable number of methyl ester groups. Draw the structure of Pectin. **(10 marks)**

(b). Describe the structure, sources, and applications of glucomannan, with emphasis on its functional properties. **(10 Marks)**

QUESTION 3

(a). Describe the structure, sources, significance, and applications of cellulose. **(10 Marks).**

(b). Show how chain shortening and lengthening occur in aldoses. Support your answer with structural equation (10 Marks)

QUESTION 4

(a). Explain the role of monosaccharides in living organisms, focusing on their function as an energy source and storage forms. **(5 Marks)**

(b). Describe the formation of cyclic hemiacetals in monosaccharides, including the differences between furanose and pyranose forms. **(5 Marks)**

(c). Explain the structural characteristics of pyranose rings in monosaccharides and their preferred conformations. **(5 Marks)**

(d). Discuss how substituents and structural features affect the size of the cyclic hemiacetal ring in monosaccharides. Include examples of acetal derivatives formation. **(5 Marks)**

QUESTION 5

(a). Using structural equations only, show the manipulation of the Fisher projection formula of D-glucose to bring the C-5 hydroxyl group in position for cyclization to the hemiacetal form. **(10 marks)**

(b). Complete the table below: **(10 marks)**

| Number of carbons | General terms | Aldehyde | ketone |
|-------------------|---------------|-------------|-------------|
| 3 | triose | | ketotriose |
| | tetrose | | ketotetrose |
| | pentose | | |
| 6 | | alohexose | |
| 7 | | aldoheptose | |